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June 29, 1970

To: John C.

From: [REDACTED]

Subject: Technical Progress Report No. 2
[REDACTED] 5500-6076) 70R T.O. No. 3

Reference: [REDACTED] 2201201-TPR-2

This is the second monthly contract status report on Contract [REDACTED] covering the period from 20 May to 20 June 1970. This program consists of two efforts that are technically related, the first being applied at the [REDACTED] [REDACTED] to aid in the set-up and operation of the laboratory in-house optical image processing program, the second being applied at the laboratory facility at [REDACTED] in the development of microscopic image processing. The status of each of these efforts is outlined below.

The facility at the [REDACTED] was placed in operation during the first month of this program and holographic interferometry and image processing were accomplished. The application with the holographic system included target recognition filters. During the past month this work was continued, and matched filters (the complex conjugate of the function to be filtered) were fabricated to restore linearly blurred imagery. This direction was taken to demonstrate that the holographic system possessed the capability for varied forms of image processing, including that of most relevance to the laboratory.

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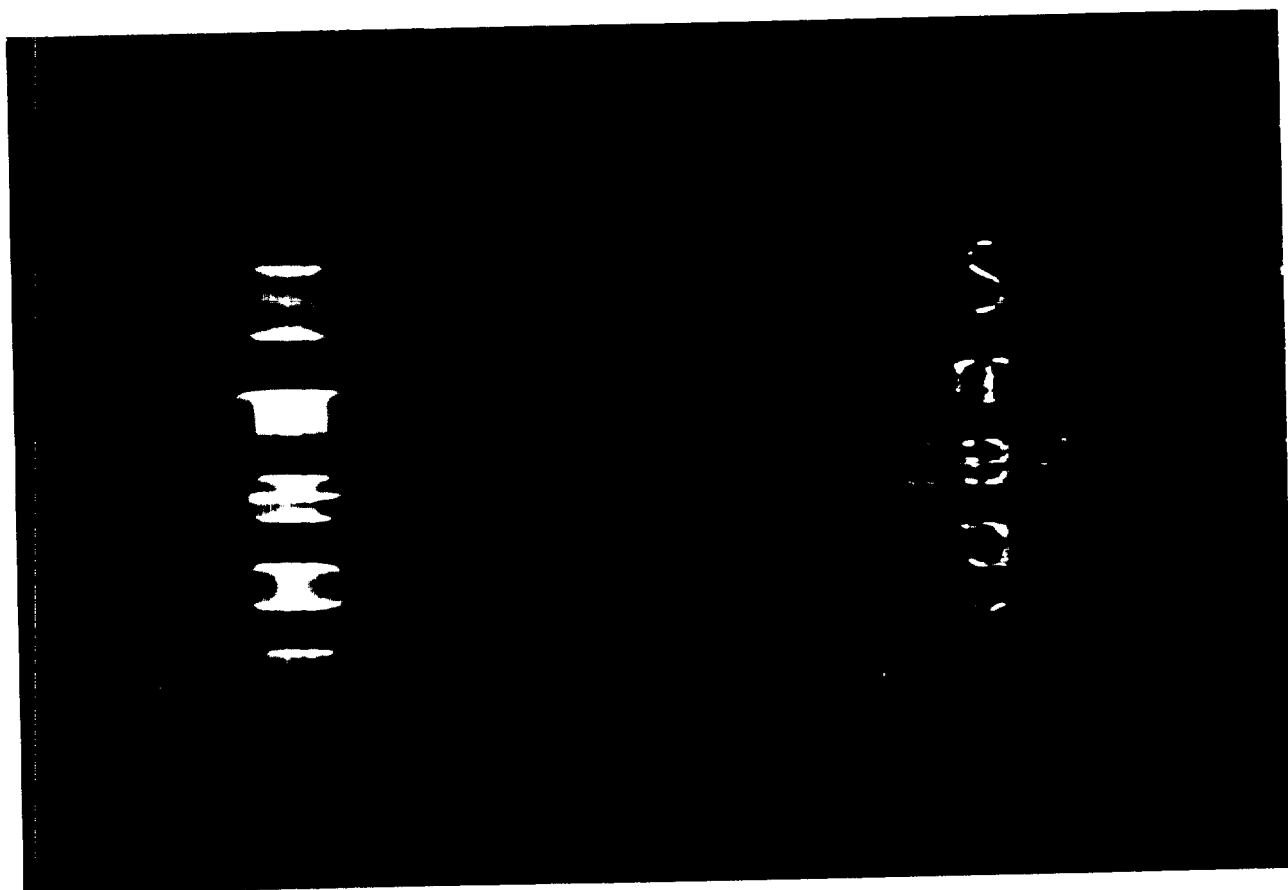
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An example of a linearly blurred image is shown here in Figure 1(a). A matched filter was constructed to demonstrate the image restoration capability of this filter form. The resultant image is shown in Figure 1(b). The side orders that appear with the restored image are results common to the use of a matched filter. The inverse form of a filter is the more optimum for restoring aberrated imagery. As this program continues the more optimum filters will be fabricated and applied, and the results will be available for comparison.



(a)

(b)

Figure 1. Illustration of a blurred image (a) and a reconstructed image (b) using a matched filter that was initially designed for target recognition applications.

Effort was also placed to restore the laboratory rooms to a clean-room status, and to perform maintenance on optical bench components. This work was carried out and the facility has improved considerably in appearance and usefulness. The machined ways of the optical benches are free of rust and components move smoothly over the lightly oiled surfaces. On 24 June, [] reviewed the status of the optical bench alignment and notebooks with Dennis R. and [] The accomplishments of [] and [] are highly commendable. They have demonstrated a good understanding of the optical process and laboratory procedures, and have performed these tasks accurately, quickly and with thorough documentation.

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The duplicate pages of our notebook on this effort are enclosed with this report. During this past month [] personnel conducted four trips to the [] spending a total of 12 man days effort at the facility. An Activity Summary Report was written and delivered to the customer after each trip.

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The microscope processing program at [] has gained momentum during this past month because of accomplishments in the analytical understanding of the Coh-mix system and the components for, and program design to test the system. It has been shown that the addition of coherent and incoherent light in the system provide a linear summation of the respective coherent and incoherent transfer functions for low contrast objects. We have analytically investigated a series of frequency responses that should provide an enhanced output of imagery through the Coh-mix microscope. We also designed a test program and have obtained 2430 film from the customer to ensure valid input material. At this time we have recorded a series of test images on the 2430, both by imaging special test targets and duping targets from 3404 material. We are also fabricating a series of amplitude filters on high resolution plates.

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During this coming month we will be testing the microscope response and evaluating its potential. Some inputs from this test should be available for the next monthly report. Regarding the program, we will now begin to emphasize partially coherent optical processing on the Beck optical bench. A program outline will be generated for this system early this month and the optical components will be set-up and initial activity in filter generation begun.

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